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10/804,675

03/18/2004

Michael Degner

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03/21/2008

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EXAMINER

PATEL, DHARTI HARIDAS

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/804,675	<b>Applicant(s)</b> DEGNER ET AL.	
	<b>Examiner</b> DHARTI H. PATEL	<b>Art Unit</b> 2836	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9, 11-24 and 26-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-24 and 26 is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-19 and 27-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9, 11-19, and 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hammound et al., Patent No. 6,553,961, in view of Kuehn, III, Patent No. 3,884,207.

With respect to claim 1, Hammound discloses an electronic circuit, comprising a first electromechanical actuator coil coupled to a first intake or exhaust valve of a first cylinder of an internal combustion engine, the first electromechanical actuator coil to control actuation of the first intake or exhaust valve between an open position and a closed position, a second electromechanical actuator coil coupled to at least one of the first intake or exhaust and a second intake or exhaust valve to control actuation of the at least one of the first intake or exhaust valve or the second intake or exhaust valve between an open position and a closed position [abstract, lines 1-10]. However, Hammound does not disclose that a first end of said second electromechanical actuator coil is coupled to a common reference with a first end of said first electromechanical actuator coil, a first energy storage device, and a second energy storage device.

Kuehn discloses an electronic circuit [Fig. 1], comprising a first electromechanical actuator coil [Fig. 1, 36] coupled to a cylinder valve of an internal combustion engine

[col. 3 lines 30-31], a second electromechanical actuator coil [Fig. 1, 38, col. 3 lines 31-32], where a first end of said second electromechanical actuator coil [Fig. 1; one end of coil 38 that is connected to node 44] is coupled to a common reference [Fig. 1, common terminal 44] with a first end of said first electromechanical actuator coil [Fig. 1; one end of coil 36 that is connected to node 44]; a first energy storage device [Fig. 1, 46], where a first end of said first energy storage device is coupled to said common reference [Fig. 1; - terminal of capacitor 46 is coupled to a common reference 44 via PD 56]; and a second energy storage device [Fig. 1, 48], where a first end of said second energy storage device is coupled to said common reference [Fig. 1; - terminal of capacitor 48 is coupled to a common reference 44 via PD 58], and wherein a charge balance is maintained on said first and second energy storage devices [Fig. 1; capacitors 46 and 48 maintain a balance of charge between them depending on which of switches 26 or 30 is closed or open, by passing charge back and forth during the appropriate alternation of flywheel 12 (col. 6 line 35-40). Capacitors 32 and 34 also meet this limitation since they similarly maintain a balance of charge between them by draining off switching arcing energy, depending on which of switches 26 or 30 is closed or open (col. 3 lines 10-17)].

Hammound and Kuehn are analogous control circuits for controlling the combustion of internal combustion engines. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Kuehn's capacitors, into Hammound's electronic control circuit, for the benefit of maintaining a balance of charge by draining off switching arcing energy.

With respect to claim 2, Kuehn discloses that the first energy storage device is a first capacitor [Fig. 1; 46; col. 3 lines 37-40].

With respect to claim 3, Kuehn discloses that the second energy storage device is a second capacitor [Fig. 1; 48; col. 3 lines 40-42].

With respect to claim 4, Kuehn further comprises a voltage source [Fig. 1, 46; col. 4 lines 1-4], with a first end of said source coupled to a second end of said first energy storage device [Fig. 1; + terminal of voltage source is coupled to the + side of the capacitor 46].

With respect to claim 5, Kuehn discloses that a second end of said source is coupled to a second end of said second energy storage device [Fig. 1; - terminal of voltage source 46 is coupled to a second end (- terminal of capacitor 48) terminal of said second energy storage device 48].

With respect to claim 6, Kuehn further comprises a first one-way current device [Fig. 4; diode connected between lines 22 and 24], with a first end of said one way current device coupled to a second end of said first electromechanical actuator coil [Fig. 1; node 40 is the second end of the first actuator coil 36, which is connected to the cathode side of diode].

With respect to claim 7, Kuehn further comprises a second one-way current device [Fig. 4; diode connected between lines 22 and 28], with a first end of said one way current device coupled to a second end of said second electromechanical actuator coil [Fig. 1; node 42 is the second end of the second actuator coil 38, which is connected to the cathode side of diode].

With respect to claim 8, Kuehn further comprises a first switch [Fig. 1, 26] for actuating said first electromechanical actuator coil [Fig. 1, 36]; and a second switch [Fig. 1, 30] for actuating said second electromechanical actuator coil [Fig. 1, 38].

With respect to claim 9, Kuehn discloses a system [Fig. 1], comprising a dual-coil half bridge [Fig. 1; consists of coils 36 and 38; col. 3, lines 30-32] converter adapted to be coupled to a single or multiple coil actuator of a cline valve, the cylinder valve in an internal combustion engine [col. 2 lines 42-46], the converter having a first [Fig. 1, 46] and second [Fig. 1, 48] capacitor and a voltage source [Fig. 1, 46, col. 4, lines 1-4], with at least one end of each of the first and second capacitors coupled to a common reference [Fig. 1, first ends of the coils 36 and 38 are connected to the common reference node 44], the converter actuated via switches [Fig. 1, switches 26 and 30] to individually energize coils in said dual coil actuator, wherein at least one end of said actuator is coupled to said common reference, and wherein said dual-coil half bridge converter maintains a charge balance on said first and second capacitors [Fig. 1; capacitors 46 and 48 maintain a balance of charge between them depending on which of switches 26 or 30 is closed or open, by passing charge back and forth during the appropriate alternation of flywheel 12 (col. 6 line 35-40)]. However, Kuehn does not disclose the actuator being energized to control actuation of the intake or exhaust valve between an open position and a closed position.

Hammond discloses an electronic control circuit, which comprises a dual-coil converter coupled to an intake or exhaust valve of a cylinder in an internal combustion

engine, the actuator being energized to control actuation of the intake or exhaust valve between an open position and a closed position [abstract, lines 1-10].

With respect to claim 11, Kuehn discloses that the converter is adapted to be coupled to a plurality of engine cylinder valves [Fig. 1, cylinders A and B; col. 3 lines 30-32].

With respect to claim 12, Kuehn discloses that the dual coil half bridge converter [Fig. 1; consists of coils 36 and 38] maintains a charge balance on said first and second capacitor [Fig. 1, capacitors 46 and 48] even when at least one cylinder of the engine is deactivated while at least one other cylinder carries out combustion [Fig. 1; capacitors 46 and 48 maintain a balance of charge between them depending on which of switches 26 or 30 is closed or open, by passing charge back and forth during the appropriate alternation of flywheel 12 (col. 6 line 35-40)].

With respect to claim 13, Kuehn discloses that the capacitors form a dual voltage source [col. 4 lines 1-9].

With respect to claim 14, Kuehn discloses that the dual coil half bridge converter is adapted to be coupled to at least two dual coil actuators [Fig. 1; consists of two coils 36 and 38] of two cylinder valves [Fig. 1, cylinders A and B], wherein the converter is configured to balance voltage of said first and second capacitor [col. 4 lines 10 - 53].

With respect to claim 15, Kuehn discloses a dual coil half bridge power converter system, comprising a power source [Fig. 1, 46]; a single or multiple coil actuator of a cylinder valve [Fig. 1; cylinder valves A and B; col. 2, lines 43-46, lines 55-57], the cylinder valve in an internal combustion engine [col. 2 lines 43-46], only one actuating

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switch [Fig. 1, 26] for actuating each coil [Fig. 1, coils 18 and 20] in said actuator; and an energy storage device [Fig. 1, 46; col. 3 lines 38-42] for storing energy during deactivation of at least one coil [col. 3, lines 12-17]. However, Kuehn does not disclose an intake or exhaust valve of a cylinder, the valve having an armature and at least one spring.

Hammond discloses an intake or exhaust valve of a cylinder, in an internal combustion engine, [abstract, lines 1-10], the valve having an armature and at least one spring [all valves have an armature and one spring so they can close and open], a single actuator coupled to the intake or exhaust valve, the actuator configured to control lift of the intake or exhaust valve between an open position and a closed position by selectively driving the armature against the force of the at least one spring [abstract, lines 1-10]

With respect to claim 16, Kuehn further comprises a unidirectional current device [Fig. 4, upper diode] for allowing freewheeling current during deactivation of at least one coil [Fig. 1, Fig. 1, 18].

With respect to claim 17, Kuehn discloses that the storage device includes two capacitors in a split voltage power supply topology [Fig. 1, 32 and 34].

With respect to claim 18, Kuehn discloses that the energy storage device includes two capacitors [Fig. 1, 32 and 34] in a boosted power supply topology.

With respect to claim 19, Kuehn further comprises a plurality of dual coil actuators of cylinder valves of an engine [col. 2, lines 43-46, lines 55-57], and only one



actuating switch [Fig. 1, 26] coupled to each coil [Fig. 1, coils 18 and 20] of said plurality of coils [Fig. 1, 18 and 20].

With respect to claim 27, Hammond discloses that the first electromechanical actuator coil and the second electromechanical actuator coil control actuation of different intake or exhaust valves of different cylinders and the charge balance is maintained on said first and second energy storage devices based on a coordinated firing order of the different cylinders [abstract lines 1-10].

With respect to claim 28, Hammond discloses that the first electromechanical actuator coil and the second electromechanical actuator coil cooperatively control actuation of the first intake or exhaust valve between a substantially fully open position and a substantially fully closed position [abstract lines 1-10].

With respect to claim 29, Hammond discloses that the first electromechanical actuator coil controls actuation of the first intake or exhaust valve and the second electromechanical actuator coil controls actuation of the second Intake or exhaust valve [abstract lines 1-10].

With respect to claims 30 and 31, Hammond discloses that the first intake or exhaust valve is in operative communication with the first cylinder and the second intake or exhaust valve is in operative communication with the first cylinder; and that the first intake or exhaust valve is in operative communication with the first cylinder and the second intake or exhaust valve is in operative communication with a second cylinder [abstract lines 1-10].

With respect to claim 32, Kuehn discloses that charge balance is maintained by disabling at least some of the plurality of cylinders in natural charge sharing pairs [col. 3 lines 56—col. 4 lines 57].

***Allowable Subject Matter***

Claims 20-24 and 26 is allowed.

The following is an examiner's statement of reasons for indicating allowance of claim 20: The prior art does not disclose that the system further comprises third and fourth coils, wherein said system is configured to balance voltage across said first, second, third, and fourth coils. This feature in combination with the rest of the claim limitations is not anticipated or rendered obvious by the prior art of record.

***Response to Arguments***

Applicant's arguments with respect to claims 1-9, 11-24, and 26 have been considered but are moot in view of the new ground(s) of rejection.

A new reference by Hammond [Patent No. 6,553,961] has been introduced to meet the limitation of a first electromechanical actuator coil coupled to a first intake or exhaust valve of a first cylinder of an internal combustion engine, the first electromechanical actuator coil to control actuation of the first intake or exhaust valve between an open position and a closed position, a second electromechanical actuator coil coupled to at least one of the first intake or exhaust valve and a second intake or exhaust valve to control actuation of the at least one of the first intake or exhaust valve and the second intake or exhaust valve between an open position and a closed position.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dharti H. Patel whose telephone number is 571-272-8659. The examiner can normally be reached on 7:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Sherry can be reached on 571-272-2800, Ext. 36. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

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published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dharti H Patel/

Examiner, Art Unit 2836

03/16/2008

/Stephen W Jackson/

Primary Examiner, Art Unit 2836